

(12) UK Patent Application (19) GB (11) 2 278 626 (13) A

(43) Date of A Publication 07.12.1994

(21) Application No 9411110.1

(22) Date of Filing 03.06.1994

(30) Priority Data

(31) 9400746	(32) 15.01.1994	(33) GB
9401299	22.01.1994	
9311674	05.06.1993	
9312724	19.06.1993	
9321677	18.10.1993	
9316877	13.08.1993	

(51) INT CL⁵
E05D 13/00

(52) UK CL (Edition M)
E1J JFA

(56) Documents Cited
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(58) Field of Search
UK CL (Edition M) E1J JFA
INT CL⁵ E05D 13/00
Online World Patents Index

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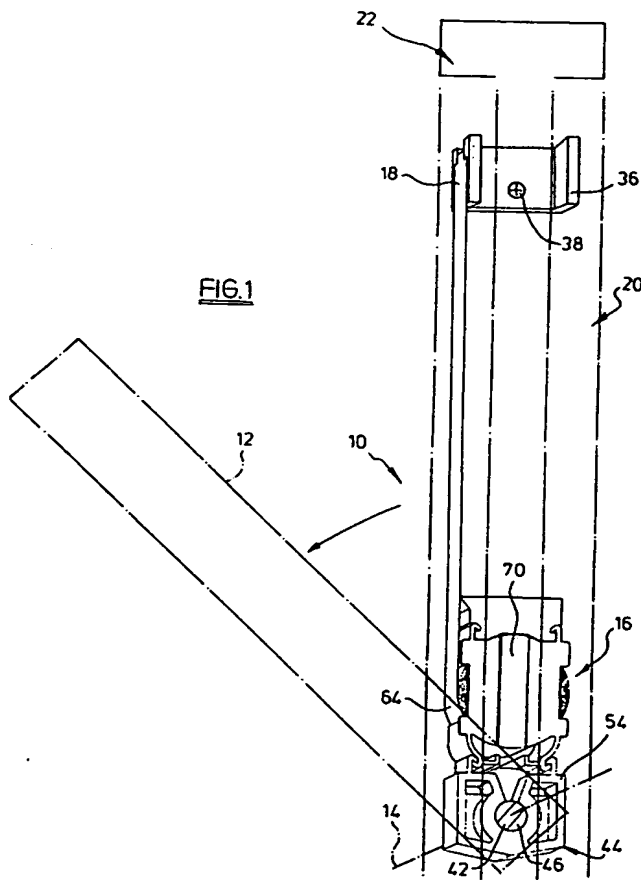
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(54) Spring-balanced, tiltable, sliding sash window

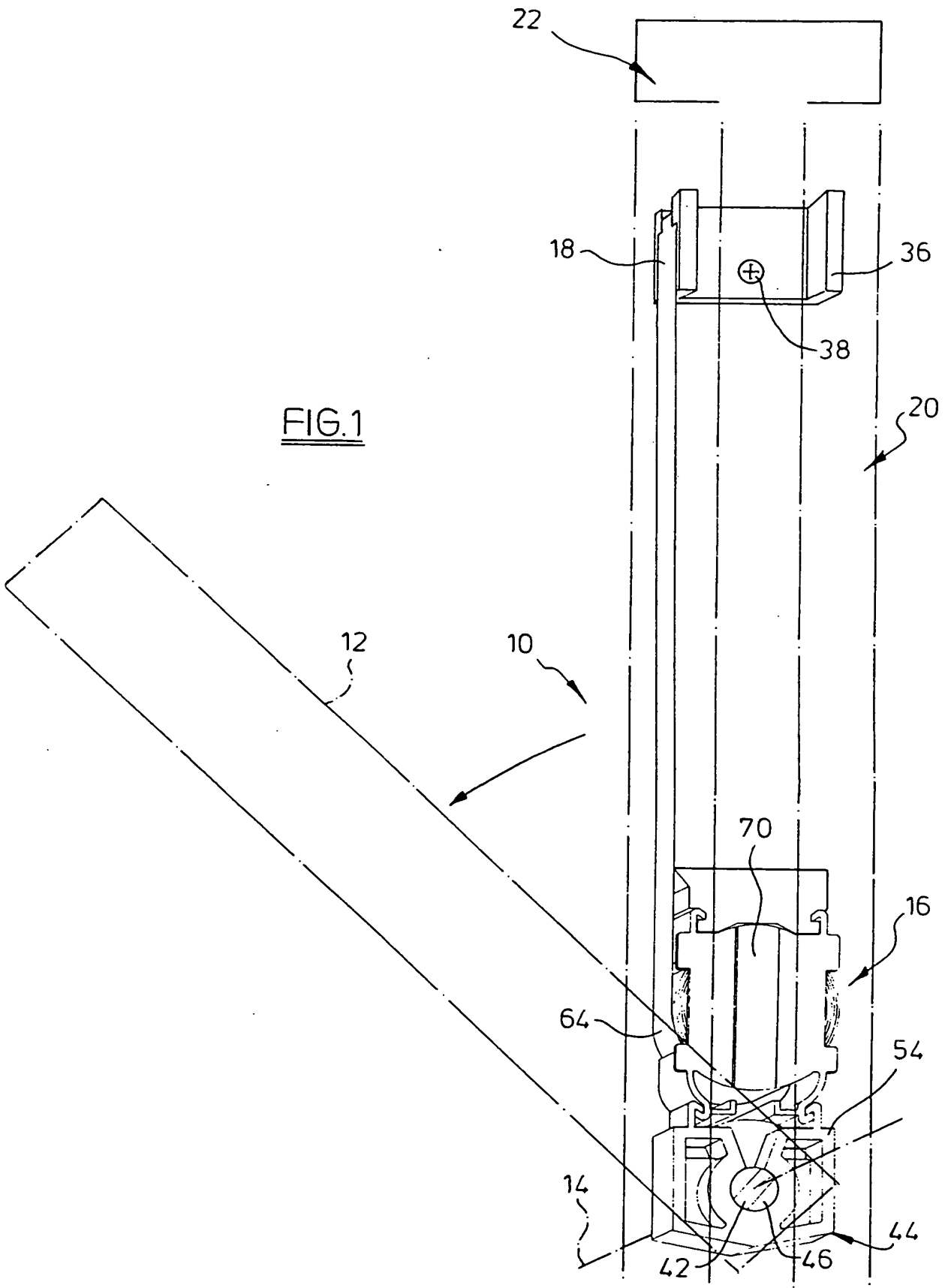
(57) A tilt sash window system has a counterbalance spring 16 mounted for movement with the sliding sash 12. A releasable securing catch projects into a jamb channel containing the spring and its end hanger and clears the latter. A tilt-action shoe 44 is connectible to the spring by an endwise snap action and by laterally outward movement therebetween. A movable lock member provides security against disconnection. In the tilted position of the sash, a stay counterbalances the overhung weight. In a vertical tilt axis embodiment the moving spring body locates below the upper pivot shoe. The spring end is connected to the vertical jamb channel by a screwless self-fixing hanger having a tilt action under spring tension forces.



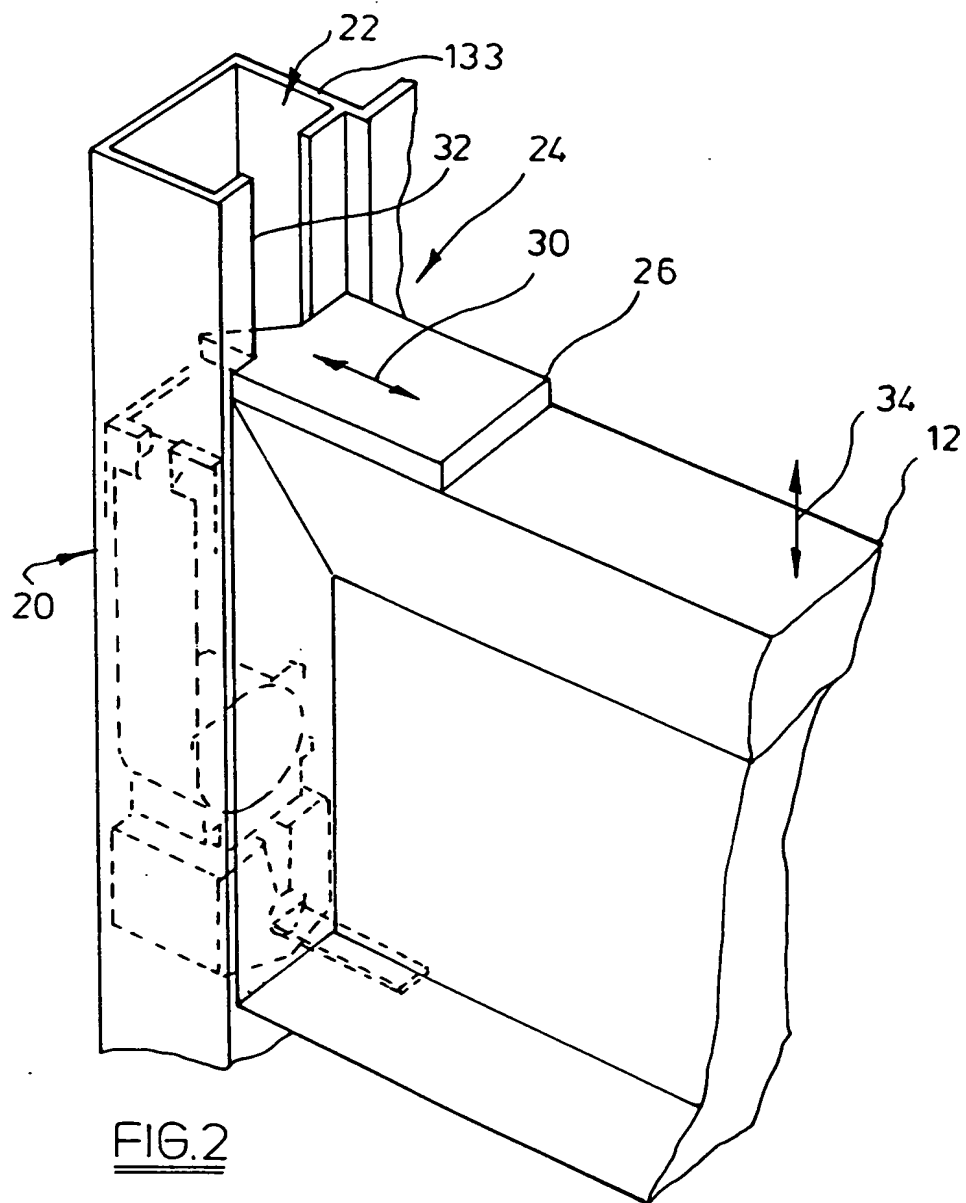
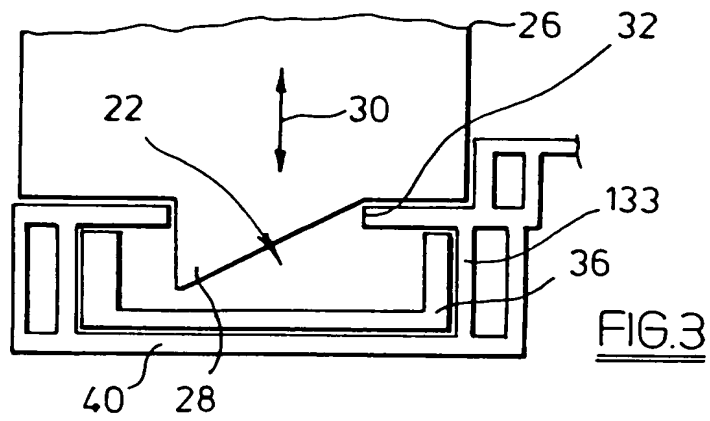
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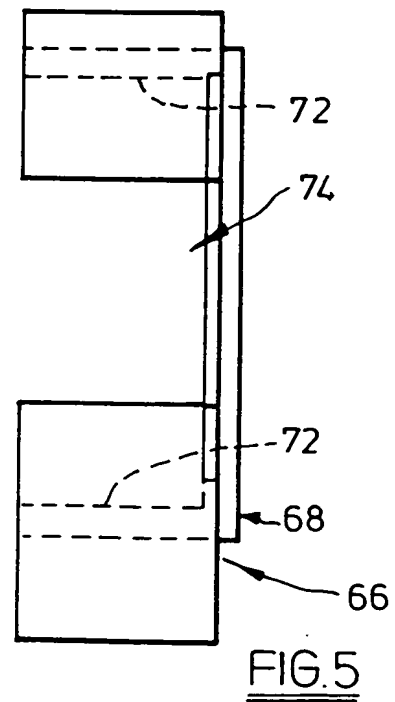
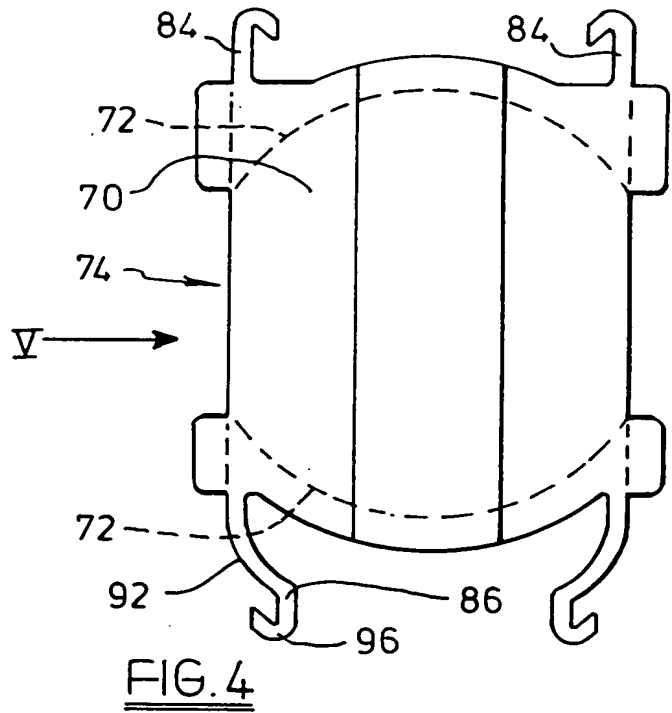
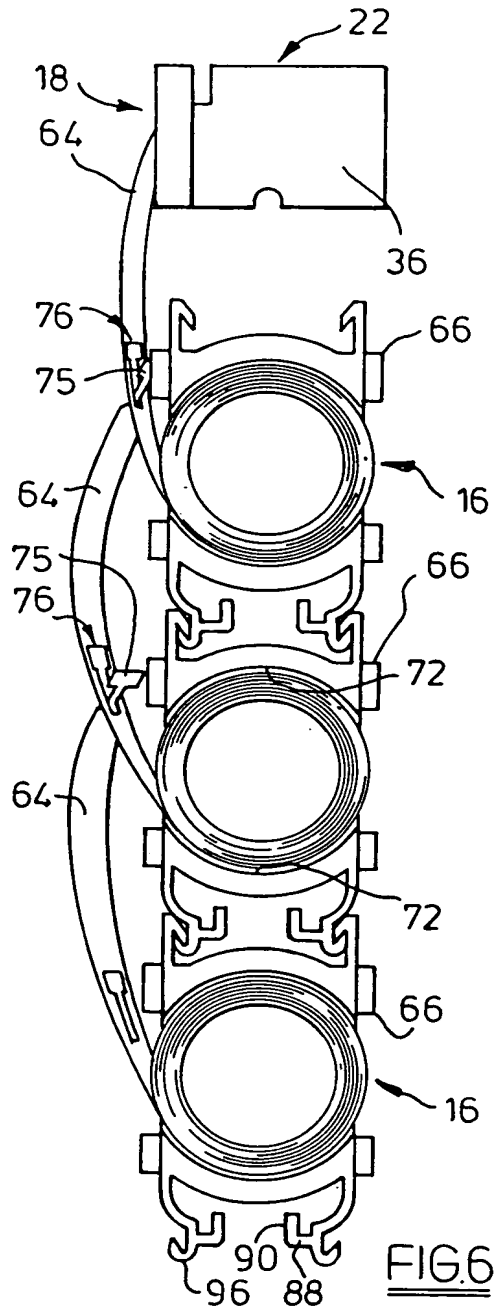
FIG.1



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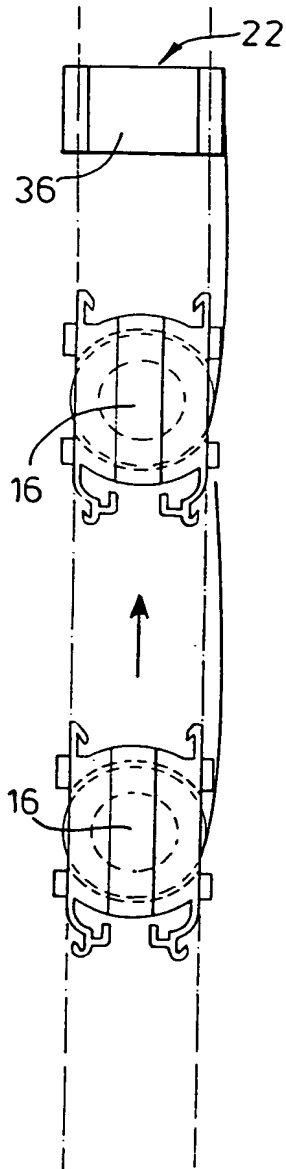


FIG. 7A

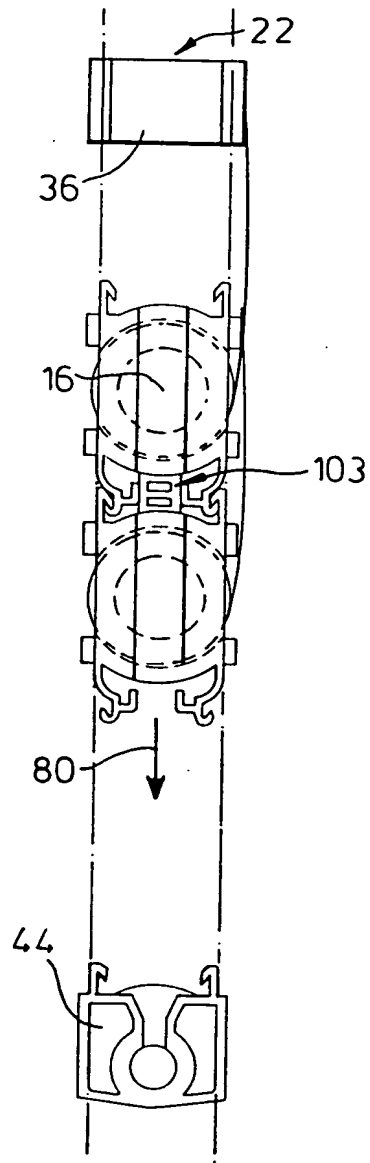


FIG. 7B

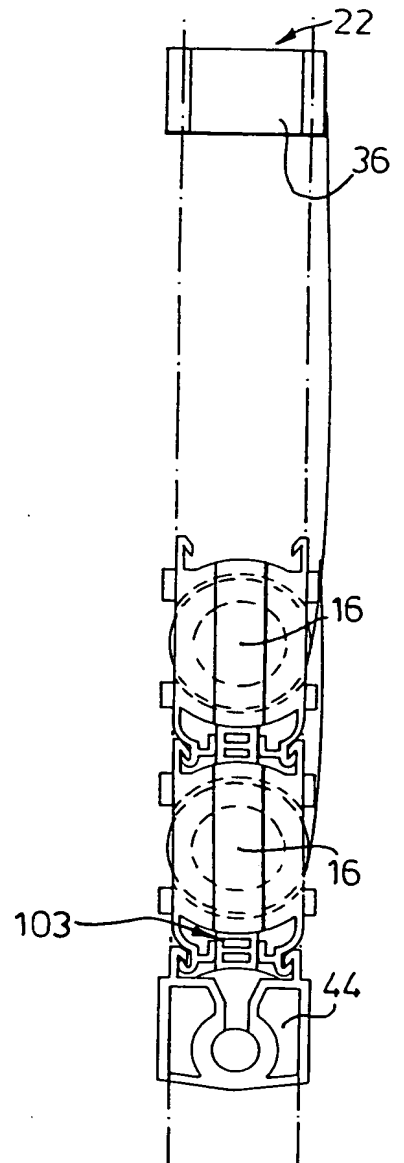


FIG. 7C

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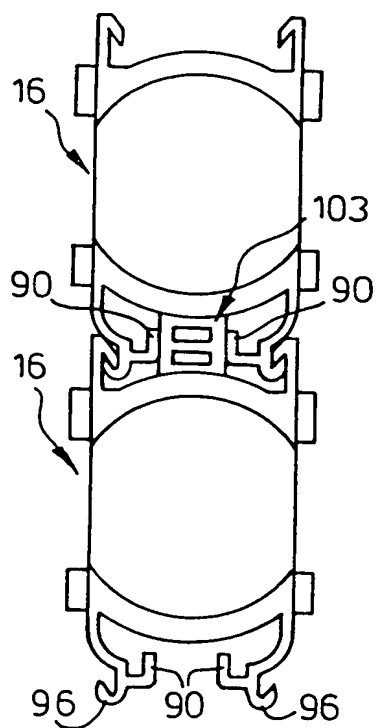


FIG. 7D

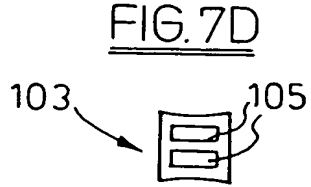


FIG.7F

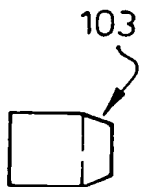


FIG. 7E

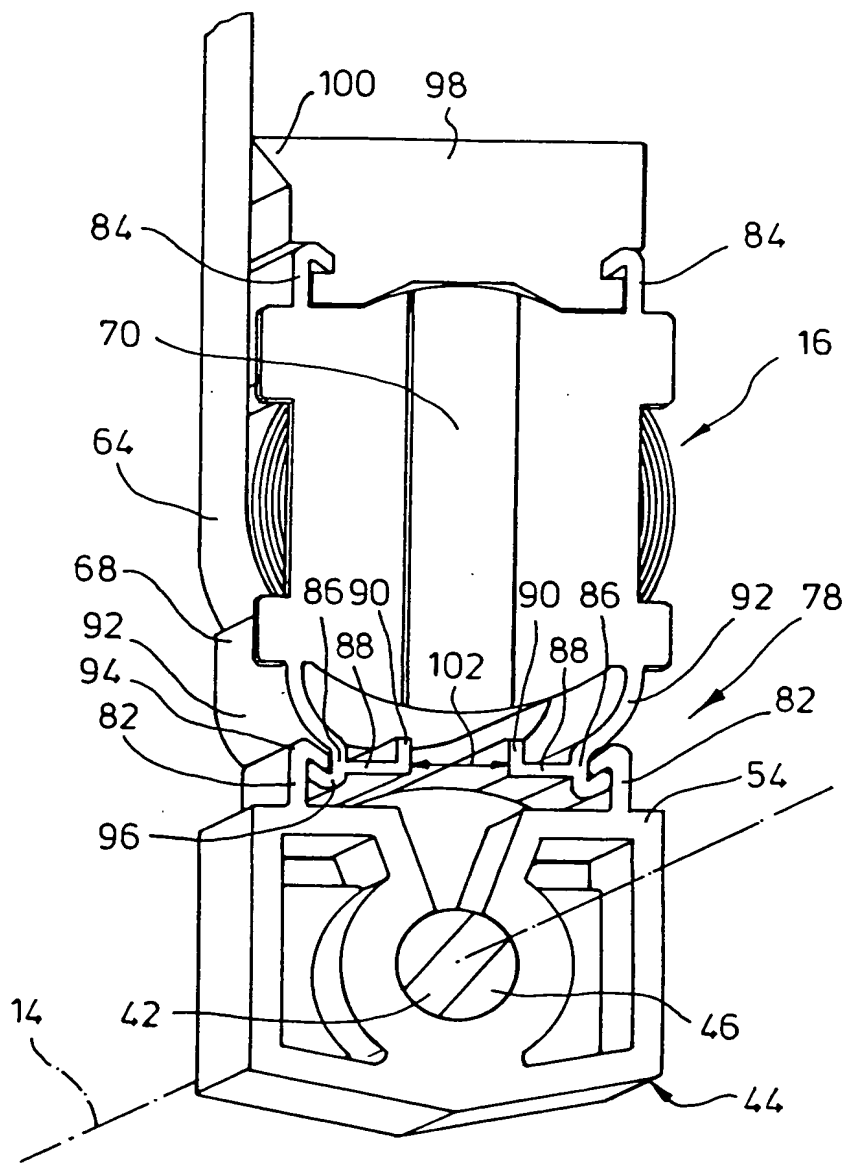
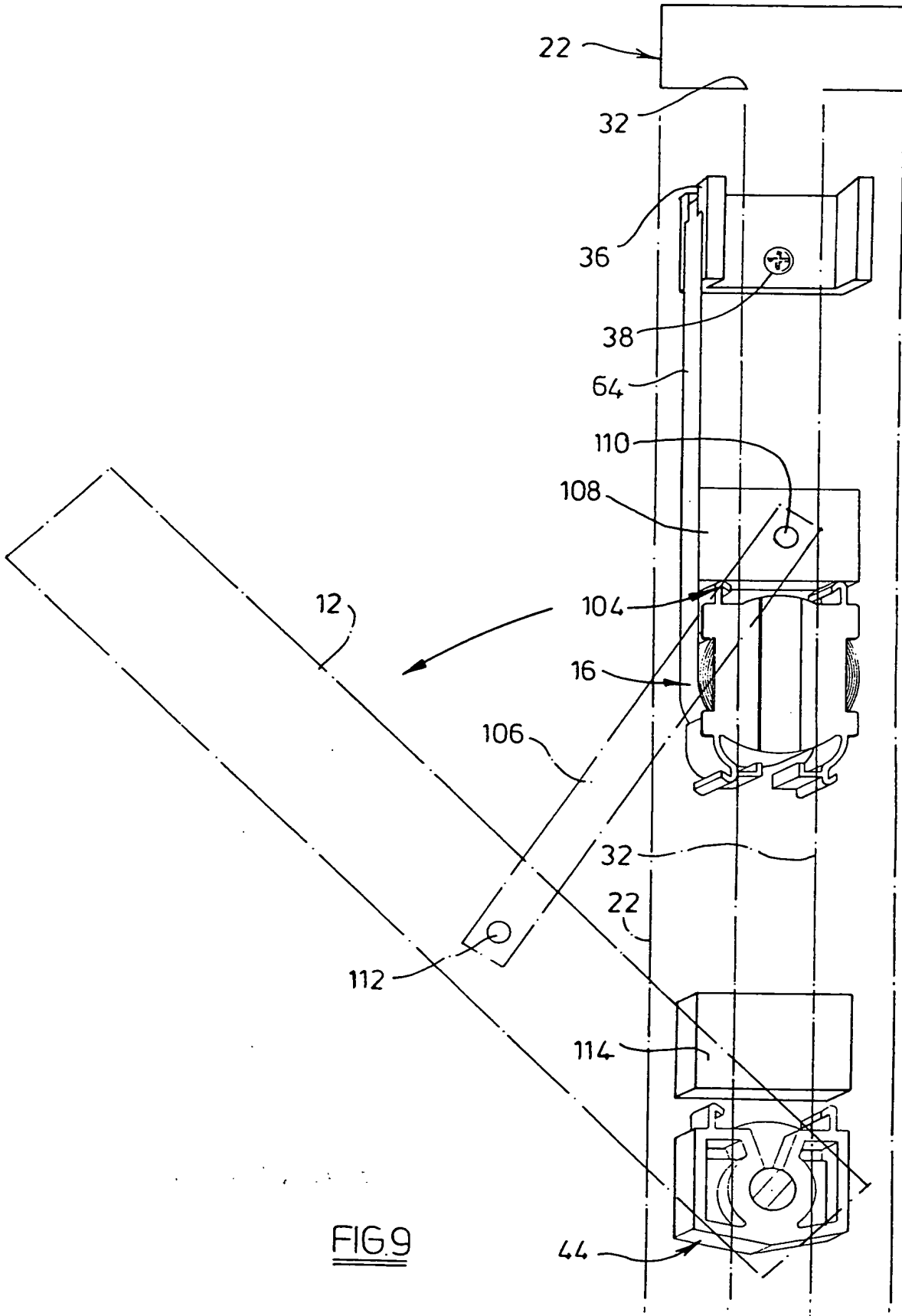
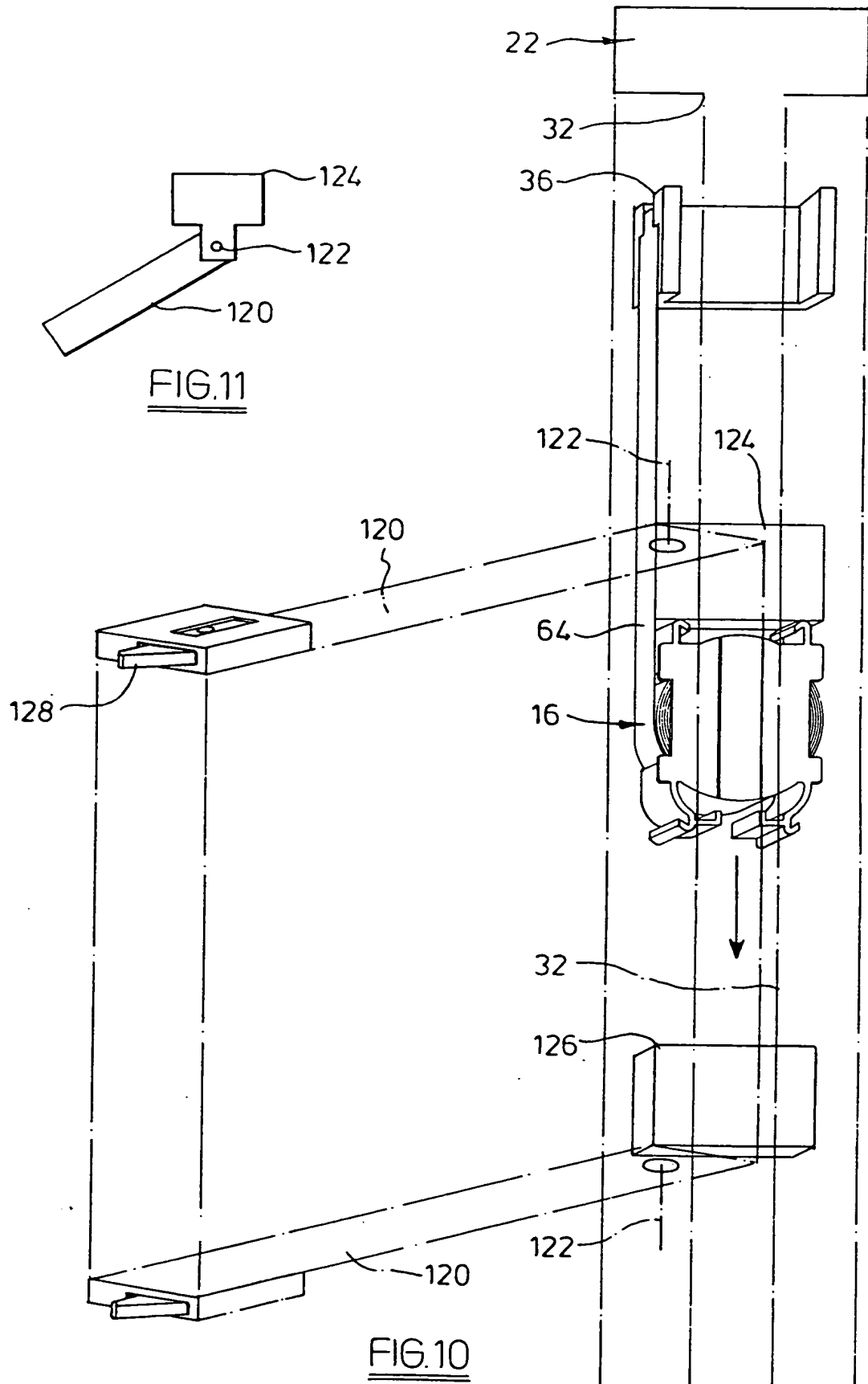
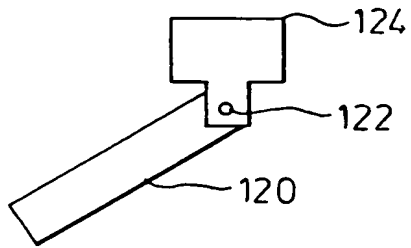


FIG. 8

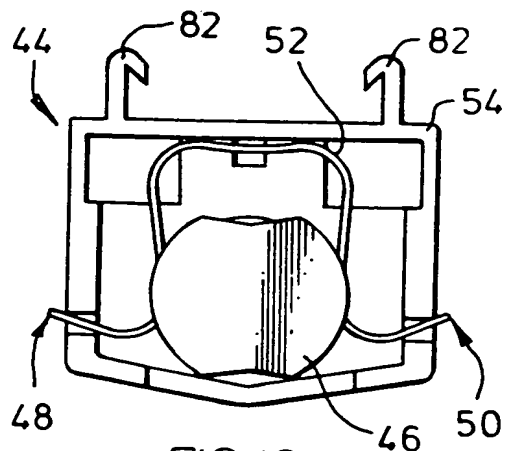
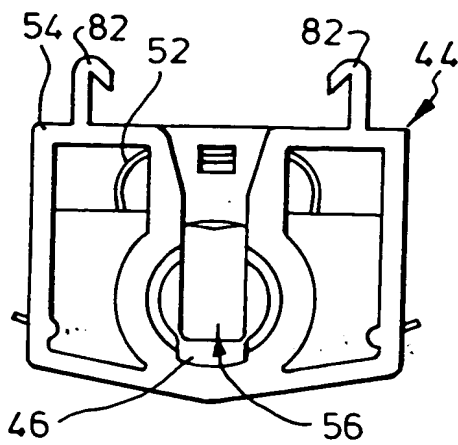
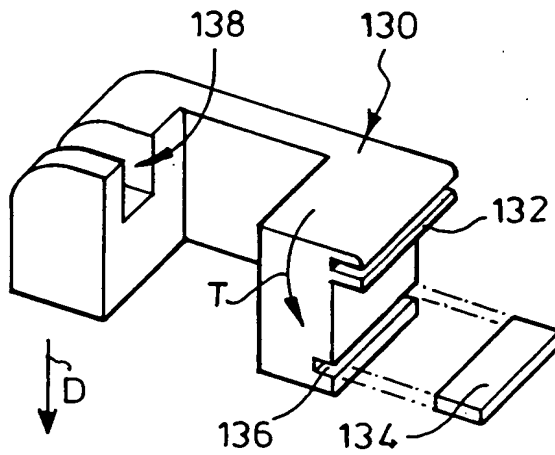
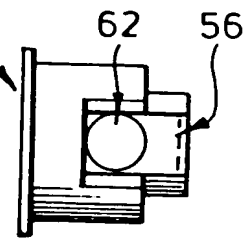
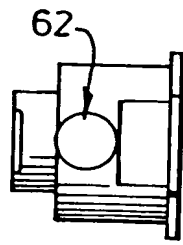
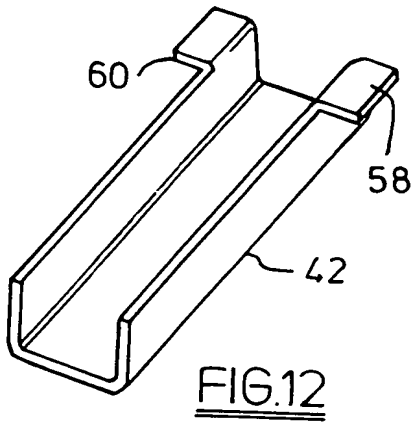
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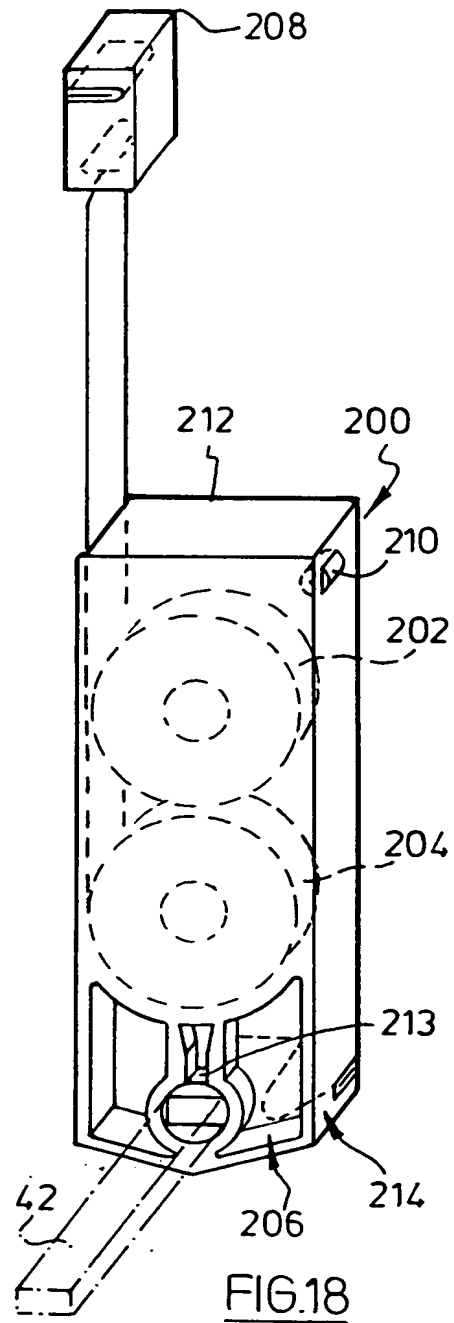
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TILT SASH SPRING SYSTEM

FIELD OF INVENTION

This invention relates to tilt sash spring systems in which a slidable sash is counterbalanced by a spring system, has facilities for sash tilt, for example for cleaning purposes, and may be provided with means for offsetting the effects of the partially overhung weight in the sash-tilted position. The invention is concerned with aspects of the provision of sufficient sash travel in the opening direction, ease of assembly and disassembly of the spring system, security of connection between the spring system components including pivot systems thereof, and offsetting the partially overhung weight in the sash-tilted condition.

BACKGROUND

Spring-counterbalanced sash systems include systems using constant force coiled springs, for example as disclosed in US 5,232,208 (BRAID ET AL) which discloses a system enabling such springs to be used in multiples so as to counterbalance sash windows of varying weight.

Multiple spring systems have implications in relation to the extent to which the sliding sash can open in view of the space implications of the springs themselves. This applies equally to other spring systems. The problem arises from the sash tilt feature that the sash retaining member or catch, usually located at the top edge of the sliding sash, describes a volume of movement in which the springs cannot be located. Accordingly, this factor represents a limitation on the available extent of sash opening in some cases.

Turning to the question of assembly and disassembly of the tilt sash spring system, the use of multiple springs as disclosed in the above-mentioned prior patent to Braid et al brings with it a need to facilitate assembly and disassembly of such springs in relation to the sash jamb channels. The requirement here is for ease of assembly as original equipment while permitting disassembly for maintenance purposes. A particular requirement arising relates to the need to enable the tilt sash pivot bars to be readily inserted into their respective sliding shoes. There is also a need for security of connection between the spring-loaded components of the assembled sash system to avoid the possibility of significant damage arising in the event of release of the tensioned springed system inadvertently during use or transit and arising from accidental disconnection of spring system parts, including the pivot bars from their respective slidable pivot shoes.

A further aspect of the invention relates to offsetting the effect of the partially overhung weight of the tilted sash. While locking or braking sash shoes have been provided to offset the net upward force exerted on the sliding sash when tilted inwards for cleaning, there remains a need for a system to reduce the effect of the overhung weight on the user.

The tilt sash spring system of this invention provides improvements in relation to one or more of these matters, or generally, by means of a sash spring system as defined in the accompanying claims. In the embodiments the tilt sash spring system provides increased sash opening travel, ease of assembly of spring system parts and security of connection therebetween, together with an embodiment in which the overhung weight of the tilted sash is at least partially offset.

A still further aspect of the invention relates to the mode of connecting the counterbalance spring to the tilt sash while avoiding the space constraints on sash travel imposed by prior art proposals, without
5 the need for providing a specially constructed sash with a recess or the like to accommodate the spring, and which can accommodate tilting of the sash without consequential difficulties arising from such tilting due to the interconnection of the spring means between
10 the sash and the jamb.

Thus, in accordance with this aspect of the invention the tilt sash window system has the spring means coupled to a tilt action shoe serving to couple the spring to the sash. The shoe and the spring means
15 are both slidably located in a jamb channel. The jamb channel extends lengthwise of the jamb structure and alongside the sash in its working position, and thus in a generally upwardly direction. The jamb channel is located between the jamb structure and the slidable
20 sash. In this way, the coupling of the shoe and the spring means permits the spring means to apply its counterbalancing lifting force to the sash through the tilt shoe. As a result, the spring means travels with the sash as it slides while continuously applying its counterbalancing force to the shoe and thus to the
25 sash. Because the shoe itself accommodates the tilting movement of the sash, the counterbalancing force is applied to the sash without any twisting of the spring element. Moreover, because the spring means travels with the sash, the space constraints imposed by prior art fixed spring systems are overcome, and the hanger for attaching the spring end to the jamb or the channel can be of such dimensions and so located that it does not limit sash travel.

35 In one embodiment, the spring means is coupled to the upper one of a pair of tilt shoes defining an

upwardly extending sash tilt axis. Such coupling may be provided by locating the spring means below the shoe. In another embodiment the shoe is connected to the sash by a pivoted stay. In another embodiment, the spring means is coupled to the tilt shoe by being connected thereto by quick-attach connectors, and the shoe is directly coupled to the sash through pivot bars.

SUMMARY OF THE INVENTION

In a tilt sash window system having counterbalance spring means acting between the sash and the sash frame or jamb, releasable and projecting securing means co-operates with the jamb structure to releasably secure the tiltable sash in its working position. The counterbalance spring is connected to the sash for movement with it and the spring end is connected to the jamb. The spring end mounting is of such dimensions and so located that the projecting sash securing means can move past it so that sash movement is not thereby restricted.

Thus, by mounting the counterbalance spring body at, effectively, a constant distance from the tilt sash securing means, and having a relatively small spring end mounting, the limitations on sash movement imposed by spring size are effectively removed.

There is disclosed in US 2,609,193 and US 3,475,865 in each case a sash window assembly in which counterbalance spring means is mounted on a sliding sash member, for movement therewith. However, these proposals do not relate to tilt sash windows and accordingly the problems explained above inherent in the use of projecting and releasable securing means for such a system do not arise, and thus the man skilled in the art will find no objective disclosure in these specifications which is of assistance to him

in solving the above-mentioned problem. The disclosures in US 2,732,594 and GB 825,153 while showing the use of a spring body which moves with a sliding window, likewise lack any teaching in relation to the problems arising from a requirement for window tilt, or any suggestion as to how these problems could be solved in relation to the location of a counterbalance spring system in a jamb channel in a tilt sash window system.

In an embodiment of the present invention, the spring means and the sliding sash pivot shoe are mounted together at the sash tilt axis and constructed so as to be interconnectable upon assembly. This is achieved by means of complementary interengageable connection elements. As a result, assembly is facilitated by permitting the tilt sash pivot bars to be inserted into the slidable sash pivot shoes before these latter are connected to their associated springs. Also in the embodiment, provision is made for one or more additional springs to be connected to the first-mentioned spring by virtue of corresponding complementary and interengageable quick-attach connection elements which permit structural interconnection of the body portions of the spring means during assembly.

In the embodiment, the construction of the connection elements is such that not only is connection possible by a snap-action connection caused by relative movement of the structures lengthwise of the jamb channel, but also disengagement is permitted when the connection elements effect relative movement laterally of the lengthwise axis of the jamb. In this way, disconnection by outward movement of the spring elements or indeed of the slidable shoe is obtainable for servicing purposes. In this way also, parts of the spring system can be removed through an opening or

notch cut in the jamb channel for servicing purposes. Modular removal of the sash system components in this manner enables a relatively small notch or opening to be employed. Security of connection between the spring assemblies and between these and the sliding shoe is provided in an embodiment by means of a locking member which is selectively locatable to co-operate with the connection elements to co-operate therewith and inhibit resilient deflection in the direction permitting disengagement.

In another embodiment, security of connection between the tilt sash pivot bars and their associated shoes is provided by means of one or more projecting abutments on the pivot bars which co-operate with complementary structures on the pivot shoes to inhibit disengagement in the event of the jamb structure bowing outwardly during use or transport.

In another embodiment, the effect of the partially overhung weight of the tilted sash during cleaning or servicing operations is at least partially offset by means of a stay structure which connects the spring means to the sash while permitting tilting and still applying an upthrust to the tilted sash so as to offset at least part of the overhanging weight thereof. By connecting the moving spring to the sash through a stay bracket, the usual generally vertically-orientated loads are applied to counterbalance it during normal use and, when tilted, the loads applied at a corresponding angle to the sash serve to offset partially its overhung weight.

The invention also provides a tilt sash window system in which the counterbalance spring means is connected to the slidable sash for movement with it. The spring means is coupled to a tilt action shoe serving to couple the spring to the sash. The shoe and the spring are slidably located in a jamb channel.

The arrangement permits the spring to counterbalance the sash through the tilt shoe while the spring travels with the sash. In one embodiment the tilt shoe is the upper one of a pair of such shoes defining an upwardly extending sash tilt axis. In another embodiment the shoe is coupled to the sash by pivoted stay means. In yet another embodiment the shoe is directly coupled to the sash through pivot bars.

DRAWINGS

Fig 1 is an elevation view of a first embodiment showing a single counterbalance spring, an associated slidable pivot shoe and the tiltable sash being shown in its tilted position;

Fig 2 shows, somewhat diagrammatically, the tilt sash system of Fig 1 with the releasable securing means shown at the top edge of the sash;

Fig 3 shows a partial plan view of the securing means of Fig 2;

Fig 4 shows a detailed plan view of a spring housing seen in Fig 1;

Fig 5 shows a side elevation view of the housing of Fig 4, the direction of viewing being indicated by arrow V in Fig 4;

Fig 6 shows a perspective view of three interconnected spring assemblies and an associated hanger for insertion into a jamb channel;

Fig 7 shows in subfigures 7A, 7B and 7C three stages in the assembly of two springs with an associated slidable shoe;

Fig 8 shows, on a larger scale, a spring and shoe assembly of Fig 1 to illustrate the structure in more detail in relation to the mode of connection and disconnection:

Fig 9 shows, in a view similar to that of Fig 1, a further embodiment in which a stay is provided to

offset partially the weight of the sash in its tilted position;

Fig 10 shows a further embodiment in which the sash tilts about a vertical tilt axis;

5 Fig 11 shows a plan view of the sash tilt arrangement of Fig 10;

Fig 12 shows a perspective view of a sash pivot bar and Figs 13 and 14 show radial views of a bearing member of a pivot shoe viewed, respectively, from
10 directly below and directly into a slot defined therein to receive the pivot bar, the pivot bar and the bearing having, respectively, complementary projecting flanges and apertures for security connection;

15 Fig 15 shows a perspective view of a self-fixing spring end hanger for use in relation to any of the foregoing embodiments;

Figs 16 and 17 show rear and front elevation views of a brake-type pivot shoe; and

20 Fig 18 shows a perspective view of a further embodiment.

DETAILED DESCRIPTION

As shown in Figs 1, 2 and 3 a tilt sash window system 10 comprises a slidable sash 12 which is
25 tiltable about a tilt axis 14 and has counterbalance spring means 16 acting between sash 12 and a spring end 18 connected to a jamb structure 20 defining a jamb channel 22 in which spring means 16 and associated structures are located. A corresponding
30 channel is provided alongside channel 22 for the upper sash (not shown) which is constructed and arranged in a manner similar to sash 12, and is therefore not further described here.

Sash 12 has releasable and projecting securing
35 means 24 in the form of a catch member 26 having a

tapered nose 28 which projects into channel 22 in the working position of the sash as shown in Fig 2, but which can be withdrawn by movement of catch member 26 in the inward direction permitted by its mounting for back and forth movement as indicated at 30. Nose 28 projects through a vertical slot 32 formed in channel 22 to receive it. Slot 32 extends the full length of the vertical travel 34 of sash 12.

As shown in Figs 1 and 3, spring end 18 is connected to a hanger 36 secured by a fastener 38 to the rear wall 40 of channel 22, to apply loads thereto. Hanger 36 is of generally channel-section form so as to conform to the cross-sectional shape of channel 22 and thus provide the maximum amount of space to permit nose 28 of securing means 24 to pass by it, as clearly seen in Fig 3.

As shown in Fig 1, sash 12 has pivot bars 42 projecting from it at each lateral edge and received in respective sliding pivot shoes 44, one shoe in each of the channels 22 provided in each of the jamb structures 20. It is to be understood that the structure and arrangement described in relation to Figs 1 to 3 is identically reproduced at each side of sash 12, in each of these vertical jamb structures of the window assembly. Only one of these will be described.

Pivot shoe 44 comprises a plastic moulding as more fully shown in the corresponding structure seen in Figs 16 and 17. It is adapted to receive pivot bar 42 in a rotatable bearing 46 seen in Figs 13 and 14, which is insertable from the rear of shoe 44 as seen in Fig 1. Figs 16 and 17 show further details of the construction of shoe 44 in relation to the provision of bearing 46 and locking or braking teeth 48, 50 provided on a spring member 52 actuated by the cam-form of the rear portion of bearing 46. The bearing

is insertable into the rear of the plastic housing 54 of pivot shoe 44 and defines a slot 56 to receive pivot bar 42.

5 As shown in Fig 12, projecting abutments 58, 60 in the form of flanges on opposite sides of the pivot bar are adapted to co-operate with and be received in corresponding structure provided by apertures 62 formed in the base of slot 56 in bearing 46. In Fig 12 pivot bar 42 is shown on a larger scale than the
10 bearings in Figs 13 and 14.

No claim is made in this application in relation to the general structure of pivot shoe 44 whereby it allows pivotal movement and its braking or locking arrangements including teeth 48, 50 and spring member
15 52 since products of this kind were on sale prior to the filing date of the present application. Novelty is believed however to reside in the adaptation of these components for co-operation with the adapted pivot bar 42 of Fig 12 to produce security of
20 connection between the pivot bar and the pivot or braking shoe, and in the separability of the shoe from its springs.

Pivot bar 42 is fixed to the sash 12, one pivot bar at each of its opposite sides, and these project
25 outwardly therefrom. By virtue of co-operation of flanges 58, 60 with apertures 62 in bearings 46, security against accidental disengagement is provided, while removal of the sash and its pivot bar from the bearings 46 via slot 56 is nevertheless permitted when
30 the bearing is turned so that the slot opens upwardly, this being achieved by angular movement of the sash to the required removal attitude.

Spring means 16 comprises a stainless steel constant force tension spring 64 having its end 18
35 secured to hanger 36, and the main body of the spring being located in a spring housing 66 shown in Figs 4,

5 and 6. Spring housing 66 comprises a one-piece plastic moulding providing a main body 68 including a plate 70.

5 Main body 68 provides arcuate upstanding spring-retaining surfaces 72 and defines lateral openings 74 through which the springs project, as shown in Fig 6.

The springs themselves are constructed as disclosed in our above-mentioned prior US specification, being formed with hammer-head end formations 75 and corresponding complementarily shaped hammer-head openings 76, whereby the springs are connected to their hanger 36 as shown in Fig 1 (in the case of one spring), or to each other in the case of two or more springs, as shown in Fig 6.

15 Details of the systems for interconnecting pivot or brake shoe 44 and spring means 16, and indeed any further spring means provided will now be described with reference to Fig 8 of the drawings.

Fig 8 shows details of the method of connecting pivot shoe 44 to spring means 16 by means of complementary interengageable connection elements 78. These permit connection of the shoe and the spring means during assembly of the sash window by causing relative approach motion therebetween lengthwise of the jamb structure as shown in Fig 7B at arrow 80.

25 Connection elements 78 are all of generally hook-shaped form and formed as integral parts of the plastic moulding of housing 54 of pivotal brake shoe 44 and of main body 68 of spring housing 66. Thus, the connection elements are of generally resilient construction and capable of deflection for attachment and detachment as described below.

30 The connection elements 78 comprise receptor elements 82 on pivotal brake shoe 44 and corresponding receptor elements 84 on spring means 16, and complementary insertion elements 86 provided at the

lower end of spring means 16 for engagement with the receptor elements 82.

To assist actuation of the insertion elements, there are provided inward extensions 88 having flanges 90 for engagement by long-nosed pliers, in order to effect disengagement by resilient deformation of insertion elements 86. If it is desired to connect a further spring means 16 in tandem with the one shown in Fig 8, this is effected in an exactly corresponding manner to the connection to pivotal brake shoe 44 described above.

It will be noted that the insertion elements 86 of spring means 16 are provided at the outer ends of respective relatively long arcuate-form projections 92 whereby the degree of flexibility of the insertion elements is enhanced. Both the receptor elements and the insertion elements have respective hook-shaped end formations 94 and 96 which inter-engage for transmission of tension loads, as shown. The shape of these formations is such as to tend to promote and maintain their load-transmitting engagement, once connection is made.

Disconnection of these connection elements 78 may be effected either by inward deflection of the insertion elements 86, for example by means of flanges 90 and a pair of long nose pliers, or by means of relative motion between the spring means 16 and the pivot shoe 44 in the lateral direction (parallel to tilt axis 14). Accordingly, the shoe and the spring means can be interconnected initially in an endwise direction at the time of initial assembly. This is shown at 80 in subfigure 7B of Fig 7. Then, when it is desired to disassemble the spring and shoe assembly for maintenance purposes during the life of the sash system, the shoe and spring means can be separated in the lateral direction (parallel to tilt axis 14)

without even the need for a preliminary separation step in the lengthwise direction of the jamb channel and arrow 80 in Fig 7B. As a result, the spring and/or shoe structures can be removed from the jamb channel by a simple notching out process in which a
5 relatively short opening is cut in the plastic material of the jamb channel to permit the shoe and/or spring to be removed for servicing purposes in a modular manner. A notching-out opening in the jamb
10 channel is not shown in the drawings since it is constructed at the time of servicing and made good at the time in a manner so as to minimise the visual effect of this operation on the smooth finish of the jamb structure. The opening may of course may be
15 provided, alternatively, at the time of manufacture.

In Fig 8 the inturned receptor elements 84 at the upper end of spring means 16 can be seen to be constructed in an exactly similar manner to the receptor elements 82 on pivot shoe 44, and indeed they
20 function in an exactly similar manner for attaching a second spring means thereto.

Also seen in Fig 8 is a cushion block 98 of rubber positioned at the upper end of spring means 16 to provide a safety function in the event of
25 inadvertent detachment of the spring means from pivot shoe 44 and the associated sash. Cushion block 98 incorporates a generally wedge-shaped edge finger 100 positioned to have a wiping action against spring 64 as the finger 100 moves lengthwise of the spring when
30 the sash 12 is raised and lowered.

In use, pivot shoe 44 and spring assembly 16 together with cushion block 98 are inserted into channel 22 (illustrated at the top of Fig 1) in an endwise manner, and likewise hanger 36. Sash 12 with
35 its projecting pivot bars 42 is then located between the two side jambs and the pivot bars are lodged in

the slots 56 (see Fig 14) of the shoes 44 and then the spring assemblies are snap-fitted thereto.

5 With sash 12 in the tipped position shown in Fig 1, shoe 44 is effectively locked in its particular position by engagement of the braking teeth 48 and 50 seen in Fig 16 with the side walls of channel 22. Sash 12 can now be returned to its vertical position and its up and down free sliding movement is unaffected by catch member 26 thereon, which retains
10 it.

In the case where, as shown in Fig 6, two or more spring assemblies are employed, these are snap-fitted together in an endwise-insertion interconnecting technique. The arrangement is such that the generally
15 arcuate form of the exposed spring portions as seen in Fig 6, together with the location of the openings 76 therein and the complementary shapes of the spring end formations 75 enables endwise insertion of the springs into the channels 22 to effect an automatic snap-fitting connection of the springs in series fashion.
20 A similar connection technique applies also to the hanger 36 to which the springs are connected. This is achieved by providing the hanger with a similar receptor formation at one side to enable engagement of the upper spring's end formation in a similar manner
25 to that by which the springs connect to each other. Thus, hanger 36 has an opening (not shown) to received the hammer head end formation 75 of the upper spring 64 whereby all three springs are effectively connected to the hanger in series, the interconnection being
30 effected by mere endwise insertion of the structures into the jamb channel 22. In this way, the complications inherent in interconnecting multiple spring ends all to one hanger are largely avoided.
35 The ease of assembly derives from the location of the openings 76 and the physical relationship between the

springs.

5 Figs 7A, 7B and 7C show the entire connection sequence for the interconnection of two spring assemblies 16, an associated hanger 36, and the corresponding pivot/brake shoe 44. Fig 7A shows the initial connection of the upper spring assembly 16 to the hanger 36 followed by the endwise snap connection of the second spring assembly to the first. The springs themselves interconnect in the manner shown in Fig 6.

10 Then, as shown in Fig 7B, the two spring assemblies 16 are moved downwards, extending their springs, so as to connect to the pivot shoe 44. This assembled condition is shown in Fig 7C.

15 It is to be noted that in the embodiments of Figs 1 to 8, locking means may be provided to provide selective security of interconnection between the pivot or brake shoe 44 and the spring assembly 16, or indeed between the two spring assemblies 16, if such are employed in the manner shown in Figs 7A, 7B and 20 7C. Such locking is provided by means of a locking element indicated by arrow 102 in Fig 8, and likewise elsewhere, and acting between the flanges 90. For example, as shown in Figs 7D, 7E and 7F locking element 102 may be in the form of a solid wedge 103 25 having recesses 105 to receive plier tips, the wedge being insertable between the flanges 90 and then physically preventing the inward deflection of insertion elements 36 for disconnection purposes.

30 Turning now to the embodiment of Fig 9, this is otherwise constructed as described above in relation to Fig 1 and parts corresponding thereto are given the same reference numerals as in Fig 1, and will be described no further, except as necessary.

35 It will be seen that the embodiment of Fig 9 differs from that of Figs 1 and 8 principally by

virtue of the provision of stay means 104 acting between sash 12 and moving spring assembly 16. Stay means 104 comprises a pivoted stay 106 and a stay block 108, the latter being inserted in channel 22 above spring assembly 16 so that spring forces are transmitted by direct abutment of the spring assembly with the block and thus transmitted as tension forces in stay 106 to sash 12. Pivotal connections 110, 112 ensure free angular movement while spring loadings are transmitted to the sash.

A foam cushion 114 is provided between spring means 16 and pivot shoe 44 to function as a guard preventing compression of the spring assembly against the pivot shoe 44, and also to give the components a longer life.

In this embodiment, the spring assembly 16 is not directly coupled to the stays of 108, but merely lodged below it. Spring forces are transmitted to sash 12 simply through the stay block and the stay 106. In this way, the overhung weight of the sash, as seen in Fig 9, is at least partially offset in this sash-tilted position. In normal use of the sash window assembly, the spring counterbalance forces are transmitted to the sash through stay 106 in the vertical position. This provides smoother operation and also enables total reversal of the sash position whereby the sash can be suspended on the stays 106 and pivot bar 42, at each side of the sash. A further advantage of this embodiment is that the stays assist in guiding the sash into the window frame when the sash is returned to its normal working position.

In this embodiment, two or more springs could be employed, as in the previous embodiment, these being simply interconnected in the manner described previously and serving to load stay block 108 in the manner shown in Fig 9, one spring below the other.

Turning now to the embodiment of Figs 10 and 11, it will be seen that in this embodiment the tilt sash 120 is pivoted about a generally vertical axis 122 and is supported on hinge blocks 124, 126, the upper one 124 of which has spring assembly 16 located below it in a manner analagous to that of the stay block 108 in the embodiment of Fig 9.

In Fig 10, parts corresponding to those of Fig 9 are given the same numerals.

Sash 120 is provided with catches 128 whereby it is releasably latched in a sash-closed position in use. It is to be noted that in this embodiment, the spring counterbalance system is provided at one side only of the sash 120 since, obviously, the other side is releasable from its associated jamb structure.

In this embodiment, as in the embodiment of Fig 9, the spring assembly 16 acts on the tiltable sash through structure merely located above the spring assembly and serving to transmit loads to the sash merely by abutment of the spring assembly with that structure, and without the need for a positive interconnection.

This embodiment has the advantage that, as in the case of the embodiment of Fig 1, the extent of free sliding travel of the sash with respect to its associated guide structures is not limited by the presence of the counterbalance spring. Two or more spring assemblies can be used if needed, these being interconnected as described previously. The vertical axis pivot arrangement (the structure of the pivot itself of which is indicated, for simplicity of illustration, only in Fig 11) permits safe and easy cleaning of the tiltable sash.

Turning now to the embodiment of Fig 15, this shows a hanger 130 for optional use in place of the hangers 36 described above. In this case, hanger 130

is self-fixing not requiring a screw or other fastener 38 used in the above embodiments. This is achieved by providing the hanger 130 with a pivot member 132 to permit tilting of the hanger about the line of contact
5 between the pivot member 132 and the side wall 133 (see Fig 3) of channel 22 so as to bring a gripping element or blade 134 likewise into engagement with the side of the channel. In Fig 15, the gripping element 134 is shown detached from its slot 136 for purposes
10 of illustration, but is inserted therein like pivot member 132.

The general form of hanger 130 is as described previously, being generally of channel-shaped form and having at the opposite sides of the channel from pivot
15 member 132 a further slot 138 to receive the hammer-head formation at the end of spring 64 whereby the spring exerts a downwardly-directed force tending to cause pivoting of the hanger and thus its automatic gripping action on channel 22. The downward direction
20 of the the tension force is indicated at D in Fig 15, and the corresponding turning moment is likewise indicated at T in Fig 15.

In this way, hanger 130 provides a self-fixing action whereby mere insertion into the channel and
25 lengthwise movment along the channel to a required operating position enables the hanger to be fixed in that position by simply applying a tension force to it from the spring. The latter can be readily caused to self-attach to the hanger by locating the hammer-head
30 through slot 138. In this embodiment, the hanger has a slightly bevelled or tapered or curved profile together with just a small amount of clearance between itself and the channel whereby the tilting or turning action of the hanger is enhanced.

35 In the embodiment of Fig 18, the arrangement is otherwise as described above in relation to Fig 1, but

instead of providing pivot and brake shoe 44 separately from spring assembly 16, these are provided as an integral spring and shoe assembly 200 comprising individual springs 202 and 204, a pivot and brake assembly 206, and an associated hanger 208.

Spring and brake shoe assembly 200, its associated springs 202 and 204, together with hanger 208 are located in jamb channel 22 as described previously. Assembly 200 is assisted in its lengthwise movement within jamb channel 22 by means of a roller 210 provided on one wall of the plastics moulded housing 212 in which springs 202, 204 and pivot and brake assembly 206 are located.

Pivot bar 42 is received in a rotatable bearing member 213, as previously, and the bearing member is arranged to cam-actuate braking elements 214. These may be spring teeth, or preferably less positive braking elements such as nylon pads. The use of the latter permits insertion of pivot bar 42 more readily by virtue of tilting of the sash for insertion of the pivot bars 42 into their respective openings in the bearing members 213 after raising one of the spring and brake shoe assemblies 200 relative to the other.

Hanger 208 is secured in jamb channel 22 by means of a fastener (not shown).

Some modifications which could be made in the above embodiments, which are directly envisaged are the following. In relation to the springs, the effective space saving produced by the disclosed spring system permits the use of springs other than the disclosed constant force springs, if needed for particular applications, or otherwise. The mounting of the one or more springs in association with the pivot or brake shoe represents a convenient manner of thus mounting the spring or springs, but alternative mountings can be envisaged for particular applications

ie the use of another mode of attachment of the springs to the sliding sash. As regards the pivotal brake shoe, this will usually be provided with braking or locking means to offset the reduced upthrust in the sash-tilted condition of the window. Various forms of such a device are available. One has been disclosed. These can be chosen according to requirements. It may be possible for certain applications not to provide a braking or locking facility and thus to provide a shoe which functions mainly only as a pivot shoe.

In the case of the retaining facility for the tiltable sash, considerable variation in design is available, but those envisaged will usually involve the use of a projecting retaining member or catch of some form for co-operation with the jamb, and in most cases this provision will be made at both sides of the sliding and tiltable sash.

Further with regard to the connections between the movable spring body and the sliding sash, we have disclosed embodiments in which the spring body is connected in a quick attach/detach manner to the sliding shoe which is fixed to the tilt sash pivot bars. We have also disclosed an embodiment in which the connection is through a pivoted tilt arm or bar which permits sash tilt while simultaneously applying spring forces to the sash through the tilted arm or bar. In this latter embodiment there is no connection other than that resulting from the relative dispositions of the structures one above the other in the jamb channel. However, a direct and positive connection may be advantageous for some applications and, for example, the pivotal link could be provided directly between the spring body and the sash itself. Obviously, mechanical equivalents of the pivot bar could be provided.

In the vertical hinge system embodiment,

modifications to the manner of connecting the moving spring system to the tiltable sash can of course be envisaged, such as a direct attachment between the spring and the upper hinge post.

5 As regards the self-fixing hanger, all
embodiments are envisaged as operating by virtue of a
turning action applied by the spring end to the hanger
which causes effectively, a releasable jamming action
of the hanger in the jamb channel. It is envisaged
10 that the same effect may be obtainable by means of a
comparable camming action, the construction of the
hanger in this event being somewhat more rounded than
that disclosed, the curved cam profile portion serving
to effect the direct jamming action.

I CLAIM:

1 A tilt sash window system comprising:

a) a slidable sash tiltable about a tilt axis;

b) counterbalance spring means for said sash;

5 c) said counterbalance spring means acting between said slidable sash and a fixable spring end of said counterbalance spring means, which end is connectible to a jamb structure alongside said slidable sash;

10 d) said counterbalance spring means being connected to said slidable sash for movement therewith; and

e) said counterbalance spring means being coupled to a tilt-action shoe serving to couple the
15 spring to the sash, said shoe and said counterbalance spring means being slidably located in a jamb channel extending lengthwise of said jamb structure between the jamb structure and said slidable sash whereby said coupling of said shoe and said spring means permits
20 said spring means to apply to said sash through said tilt shoe, its counterbalancing lifting force during the sliding travel of said sash while itself travelling with said sash.

2 The tilt sash window system of claim 1 wherein
25 said tilt action shoe is the upper one of a pair of such shoes defining an upwardly extending tilt axis of said sash.

3 The tilt sash window system of claim 1 or claim
2 wherein said counterbalance spring means is coupled
30 to said shoe by being located below said shoe in said jamb channel.

4 The tilt sash window system of claim 3 wherein said shoe is coupled to said sash by pivoted stay means.

5 The tilt sash window system of claim 1 or claim 2 wherein said shoe is directly coupled to said sash through pivot bars.

6 A tilt sash window system comprising:

- 5 a) a slidable sash tiltable about a tilt axis;
 b) counterbalance spring means for said sash;
 c) said counterbalance spring means acting between said slidable sash and a fixable spring end of said counterbalance spring means which end is
10 connectible to a jamb structure alongside said slidable sash;
 d) said slidable sash having releasable and projecting securing means at a location spaced from said tilt axis to co-operate with said jamb structure
15 to secure releasably said slidable sash in its working position;
 e) said counterbalance spring means being connected to said slidable sash for movement therewith; and
20 f) said spring end being of such dimensions and so located that said projecting securing means of said slidable sash is capable of moving past said spring end of said counterbalance spring means, whereby the extent of opening of said slidable sash is not thereby
25 restricted.

7 The tilt sash window system of claim 6 further comprising a tilt action shoe connected to said spring means for sliding movement therewith lengthwise of said jamb structure and located on said tilt axis.

30 8 The tilt sash window system of claim 5 wherein said shoe and said spring means both comprise complementary inter-engageable connection elements permitting connection of said shoe and said spring

means during assembly of said sash window by causing relative approach motion therebetween lengthwise of said jamb structure.

9 The tilt sash window system of claim 8 wherein
5 additional spring means is provided to supplement said first-mentioned spring means, said first and additional spring means having respective complementary inter-engageable quick-attach connection elements permitting structural interconnection of body
10 portions of said spring means during assembly by causing relative approach motion therebetween lengthwise of said jamb structure.

10 The tilt sash window system of claim 9 wherein said connection elements have a snap-action for making
15 connection between said spring means and said shoe when said spring and shoe structures effect relative movement lengthwise of said jamb, the form of said connection elements permitting disengagement also between said spring means and said shoe when said
20 structures effect relative movement laterally of the lengthwise axis of said jamb.

11 The tilt sash window system of claim 8 wherein said connection elements are disengageable by means of relative resilient deflection thereof and wherein a
25 locking element is selectively locatable to co-operate therewith to inhibit such disengagement.

12 A tilt sash window system comprising:
a) a slidable sash tiltable about a tilt axis;
b) counterbalance spring means for said sash;
30 c) said counterbalance spring means acting between said slidable sash and a fixable spring end of said counterbalance spring means, which end is

connectible to a jamb structure alongside said slidable sash;

5 d) said counterbalance spring means being connected to said slidable sash for movement therewith; and

10 e) wherein said counterbalance spring means is connected to said slidable sash for movement therewith by stay means permitting tilting of said sash while still applying an upthrust thereto to offset at least part of the overhanging weight of the tilted sash.

13 A tilt sash window system comprising:

15 a) a slidable sash tiltable about a tilt axis;
b) counterbalance spring means for said sash;
c) said counterbalance spring means acting between said slidable sash and a fixable spring end of said counterbalance spring means which end is connectible to a jamb structure alongside said slidable sash;

20 d) said counterbalance spring means being connected to said slidable sash for movement therewith; and

e) wherein said tilt axis extends generally upwardly in use; and

25 f) said counterbalance spring means being connected to said slidable sash by being connected to an upper one of a pair of hinge members defining said tilt axis for said slidable sash.

30 14 The tilt sash window system of claim 13 wherein said counterbalance spring means is connected to said upper hinge member by being located below said member in a channel therefor in said jamb.

15 The tilt sash window system of claim 6 wherein:
a) said tilt axis is defined by a pivot

assembly comprising a pair of pivot members projecting from opposite lateral sides of said sash to be received in and to co-operate with a respective pair of pivot shoes slidably located in respective channels in said jamb structure;

b) wherein said counterbalance spring means is connected to said slidable sash through said pivot shoes and said pivot member; and

c) wherein said pivot members each have a projecting abutment in the region of its axially outer end to co-operate with its respective one of said pivot shoes to inhibit disengagement therefrom in the event of said jamb structure bowing outwards.

16 A tilt sash window system comprising:

a) a slidable sash tiltable about a tilt axis;
b) counterbalance spring means for said sash;
c) said counterbalance spring means acting between said slidable sash and a fixable spring end of said counterbalance spring means which end is connectible to a jamb structure alongside said slidable sash;

d) said tilt axis is defined by a pivot assembly comprising a pair of pivot members projecting from opposite lateral sides of said sash to be received in and to co-operate with a respective pair of pivot shoes slidably located in respective channels in said jamb structure;

e) wherein said counterbalance spring means is connected to said slidable sash through said pivot shoes and said pivot member; and

f) wherein said pivot members each have a projecting abutment in the region of its axially outer end to co-operate with its respective one of said pivot shoes to inhibit disengagement therefrom in the event of said jamb structure bowing outwards.

17 A tilt sash window system comprising:

- a) a slidable sash tiltable about a tilt axis;
- b) counterbalance spring means for said sash;
- c) said counterbalance spring means acting
5 between said slidable sash and a fixable spring end of
said counterbalance spring means which end is
connectible to a jamb structure alongside said
slidable sash;
- d) said counterbalance spring means being
10 connected to said slidable sash for movement
therewith; and
- e) wherein said fixable spring end of said
counterbalance spring means is connectible to said
jamb structure by a hanger member locatable in a jamb
15 channel which also contains said counterbalance spring
means, said hanger member being adapted to grip said
channel under the action of a load applied thereto by
said spring means.

18 The tilt sash window system of claim 17 wherein
20 said hanger member comprises a pivot member to engage
the side of said channel member and permit tilting of
the hanger member under the action of tension forces
in said spring connected thereto, and said hanger
member having a gripping element spaced from said
25 pivot member to engage and grip the side of said
channel member on said tilting of said hanger member
occurring.

19 A sash window system comprising:

- a) a slidable sash;
- b) counterbalance spring means for said sash;
- c) said counterbalance spring means acting
30 between said slidable sash and a fixable spring end of
said counterbalance spring means which end is
connectible to a jamb structure alongside said

slidable sash; and

5 d) additional spring means is provided to supplement said first-mentioned spring means, said first and additional spring means having respective complementary inter-engageable quick-attach connection elements permitting structural interconnection of the body portions of said spring means during assembly.

10 20 The sash window system of claim 19 wherein said connection elements have a snap-action for making connection between said spring means and said shoe when said spring means and shoe structures effect relative movement lengthwise of said jamb, the form of said connection elements permitting disengagement also between said spring means and said shoe when said
15 structures effect relative movement laterally of the lengthwise axis of said jamb.

20 21 The sash window system of claim 20 wherein said connection elements are disengageable by means of relative resilient deflection thereof and wherein a locking element is selectively locatable to co-operate therewith to inhibit such disengagement.

25 22 A sash window comprising a slidable sash, counterbalance spring means for said sash and said counterbalance spring means acting between said sash and a jamb structure alongside said sash.

23 A tilt sash window system substantially as described herein with reference to Figs 1 to 3, 4 and 5 of the accompanying drawings.

30 24 A tilt sash window system substantially as described herein with reference to Figs 1 to 3, 4 and 5 of the accompanying drawings, as modified by Figs 6,

7A to 7E and Fig 8 thereof.

25 A tilt sash window system substantially as described herein with reference to Fig 9 of the accompanying drawings.

5 26 A tilt sash window substantially as described herein with reference to Figs 10 and 11 of the accompanying drawings.

10 27 A tilt sash window system substantially as described herein with reference to Figs 1 to 3, 4 and 5 of the accompanying drawings, as modified by Figs 12 to 14, 16 and 17 of the accompanying drawings.

28 A tilt sash window system according to any one of claims 23 to 27, as modified by Fig 15 of the accompanying drawings.

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Relevant Technical Fields

(i) UK Cl (Ed.M) E1J: JFA

(ii) Int Cl (Ed.5) E05D 013/00, 013/12

Databases (see below)

(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE WORLD PATENTS INDEX

Search Examiner
JOHN ROWLATT

Date of completion of Search
28 JULY 1994

Documents considered relevant
following a search in respect of
Claims :-
1-28

Categories of documents

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- Y:** Document indicating lack of inventive step if combined with one or more other documents of the same category. **E:** Patent document published on or after, but with priority date earlier than, the filing date of the present application.
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Category	Identity of document and relevant passages		Relevant to claim(s)
Y	GB 2253874 A	(L B PLASTICS LTD)	1 AND 16
X,Y	GB 1287756 A	(MARLEY BUILDINGS)	X: 6, 12, 13 AND 17 Y: 1 AND 16
Y	US 5210976 A	(CRIPPS)	1 AND 16
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